

## CLAIMS

Having thus described the aforementioned invention, we claim:

1           1.     A detector assembly for quantifying concentration of positron emitters  
2 in fluids within a microfluidic assembly, comprising:

3           a base;

4           a window formed in the base;

5           a microfluidic channel disposed in the base for allowing liquids to flow  
6 through the base;

7           a solid-state charged particle detector supported by the base wherein the  
8 window is interpositioned between the charged particle detector and the  
9 microfluidic channel; and

10          the window has a thickness sufficient to allow transmission of beta particles  
11 from positron emitters within the microfluidic channel to be detected by the solid-  
12 state charge particle detector.

1           2.     The detector assembly of Claim 1 wherein:

2           a portion of the base adjacent the window and supporting the solid state  
3 charge particle detector has a thickness sufficient to substantially attenuate the  
4 transmission of beta particles whereby a linear resolution of the solid-state charge  
5 particle detector is increased.

1           3.     The detector assembly of Claim 1 further comprising:

2           a collimation well of a selected depth is disposed in the base.

1           4.     The detector assembly of Claim 3, wherein:

2           the collimation well is disposed between the window and the solid-state  
3 charge particle detector.

1           5.     The detector assembly of Claim 4, wherein the collimation well further  
2 comprises:

3           a continuous side wall defined by the base.

1           6.     The detector assembly of Claim 5, wherein the collimation well further  
2                 includes:  
3           a depth sufficient to collimate the beta particles emitted from the liquid  
4     within the microchannel enabling the detector to delineate between the particles  
5     passing through the window and those attenuated by the base.

1           7.     The detector assembly of Claim 1 wherein:  
2           the base and the solid-state charged particle detector are integral with one  
3     another.

1           8.     The detector assembly of Claim 1 wherein:  
2           a first electrode of the solid-state charge particle detector is disposed on a  
3     first side of the base and a second electrode of the solid-state charge particle  
4     detector is disposed on a second side of the base in spaced relation from the first  
5     side of the base.

1           9.     The detector assembly of Claim 8 wherein:  
2           the microfluidic channel is disposed adjacent the first or the second and the  
3     second electrodes.

1           10.    The detector assembly of Claim 1 wherein:  
2           the base is at least in part made from a material selected from the group of  
3     materials consisting of glass, polymer, silicon, or derivatives thereof.

1           11.    The detector assembly of Claim 6 wherein:  
2           the base is at least in part made from a material selected from the group of  
3     materials consisting of glass, polymer, silicon, or derivatives thereof.

1           12.    The detector assembly of Claim 7 wherein:  
2           the base is at least in part made from a material selected from the group of  
3     materials consisting of glass, polymer, acrylic, silicon, or derivatives thereof.

1           13.    The detector assembly of Claim 9 wherein:

2 the base is at least in part made from a material selected from the group of  
3 materials consisting of glass, polymer, acrylic, silicon, or derivatives thereof.

1 14. A detector assembly for quantifying a concentration of positron  
2 emitters in a microfluidic assembly, the beta detector assembly comprising:  
3 a base;  
4 a microfluidic channel disposed in the base enabling fluids to flow through  
5 the base;  
6 collimation means disposed in the base proximate the microfluidic channel  
7 for collimating charged particles; and  
8 a solid-state charged particle detector supported by the base and in  
9 communication with the collimation means.

1 15. The detector assembly of Claim 14 wherein:  
2 a portion of the base adjacent the window and supporting the solid state  
3 charge particle detector has a thickness sufficient to substantially attenuate the  
4 transmission of beta particles whereby a linear resolution of the solid-state charge  
5 particle detector is increased.

1 16. The detector assembly of Claim 14, wherein:  
2 the collimation means is disposed between the window and the solid-state  
3 charge particle detector.

1 17. The detector assembly of Claim 16, wherein the collimation means  
2 further comprises:  
3 a continuous side wall defined by the base.

1 18. The detector assembly of Claim 17, wherein:  
2 the collimation means has a depth sufficient to collimate the charged  
3 particles emitted from the liquid within the microchannel enabling the detector to  
4 delineate between the particles passing through the window and those attenuated  
5 by the base.

1 19. The detector assembly of Claim 14 wherein:

2           the base and the solid-state charged particle detector are integral with one  
3   another.

1           20.    The detector assembly of Claim 14 wherein:  
2           a first electrode of the solid-state charge particle detector is disposed on a  
3   first side of the base and a second electrode of the solid-state charge particle  
4   detector is disposed on a second side of the base in spaced relation from the first  
5   side of the base.

1           21.    The detector assembly of Claim 20 wherein:  
2           the microfluidic channel is disposed adjacent the first or the second and the  
3   second electrodes.

1           22.    The detector assembly of Claim 14 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           23.    The detector assembly of Claim 18 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           24.    The detector assembly of Claim 19 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           25.    A detector assembly for quantifying a concentration of positron  
2   emitters in a microfluidic assembly, the beta detector assembly comprising:  
3           a base;  
4           a microfluidic channel disposed in the base enabling fluids to flow through  
5   the base;  
6           a solid-state charged particle detector supported by the base; and  
7           window means disposed in the base adjacent the microfluidic channel for  
8   increasing the linear resolution of the solid-state charge particle detector.

1           26.    The detector assembly of Claim 25 wherein:  
2           a portion of the base adjacent the window means and supporting the solid  
3 state charge particle detector has a thickness sufficient to substantially attenuate  
4 the transmission of beta particles whereby a linear resolution of the solid-state  
5 charge particle detector is increased.

1           27.    The detector assembly of Claim 25 further comprising:  
2           a collimation well of a selected depth is disposed in the base.

1           28.    The detector assembly of Claim 27, wherein:  
2           the collimation well is disposed between the window means and the solid-  
3 state charge particle detector.

1           29.    The detector assembly of Claim 27, wherein:  
2           the collimation well further comprises: a continuous side wall defined by the  
3 base.

1           30.    The detector assembly of Claim 29, wherein the collimation well  
2 further includes:  
3           a depth sufficient to collimate the beta particles emitted from the liquid  
4 within the microchannel enabling the detector to delineate between the particles  
5 passing through the window and those attenuated by the base.

1           31.    The detector assembly of Claim 25 wherein:  
2           the base and the solid-state charged particle detector are integral with one  
3 another.

1           32.    The detector assembly of Claim 25 wherein:  
2           a first electrode of the solid-state charge particle detector is disposed on a  
3 first side of the base and a second electrode of the solid-state charge particle  
4 detector is disposed on a second side of the base in spaced relation from the first  
5 side of the base.

1           33.    The detector assembly of Claim 32 wherein:

2           the microfluidic channel is disposed adjacent the first or the second and the  
3   second electrodes.

1           34.    The detector assembly of Claim 25 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           35.    The detector assembly of Claim 28 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           36.    The detector assembly of Claim 31 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.

1           37.    The detector assembly of Claim 32 wherein:  
2           the base is at least in part made from a material selected from the group of  
3   materials consisting of glass, polymer, silicon, or derivatives thereof.